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A SALT–WATER CROCODILE.
(Crocodylus porosus)
Photographed on a mud bank in the Tomkinson River, Northern Territory.
By John Weichert, Maningrida, N.T.

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SPECIAL EDITORIAL

THE MON REPOS TURTLE ROOKERY NEAR BUNDABERG, QUEENSLAND.

The largest turtle rookery on mainland Australia is in danger from land development. The developer intends to subdivide (for beachside housing) a narrow strip of land behind what is about to be made an Environmental Park. *A buffer strip of only 100 metres or just slightly more has been allowed by the developer between high water mark and the houses!*

Dangers include the "light horizon" that a housing development will have causing the hatchlings to move inland towards what they consider is the sea. Increased interference with nesting turtles and hatchlings by people, children, dogs and cats are other hazards. And *the most insidious of all potential hazards is that the beach and fore-dunes* where the turtles nest *could be slowly eroding away thus reducing the already dangerously narrow proposed buffer zone.*

The developers propose blackened windows, street lights off during the turtle season, high quality fencing, ranger patrols and public awareness education. But *all of these cost money and continued diligence that is unlikely to be maintained for tens, hundreds, and more years to ensure the turtle's continued ability to use Mon Repos.* It should be noted that the developer is willing to undertake initial construction of a high quality fence, but its *maintenence and all the other proposed measures are left to the public and public authorities—can they afford the real price of this development?*

It has been said before in this editorial that *species protection is useless, unless the ecosystem of which the species is part is also conserved. Mon Repos Beach and the Turtle Rookery is a unique resource of immense educational, tourist, and scientific value which is at present viable and wisely used. To develop housing so close is too radical a step to take, the risks and costs are too high.* The authorities ought to *take a conservative approach.* The Woongarra Shire Council could *relieve the present landowners' financial burden by exempting the affected land from rates and taxes.*

What can you do?

The Woongarra Shire Council decides in the next week or two whether to allow development behind the rookery. It has already donated some land to the proposed Environmental Park. It needs *your* letter that is *supportive* rather than critical, *factual,* rather than emotional. *Urge them to reject the rezoning and development applications, and to exempt the land from rates and taxes.* Write to: The Shire Clerk, Woongarra Shire Council, Barolin St. Bundaberg. 4670.

The Queensland Parliament's Member for Burnett Mr. Wharton is a senior cabinet minister and he appears to favour the development. Send him a letter pointing out the facts, *the tourist and educational value of Mon Repos and that the development is radical rather than conservative.*

The Minister in charge of Queensland's NP&WS Mr. Elliot *has been working hard towards ensuring the rookery is not endangered.* He needs your letter of factual support.

Both can be written to at Parliament House, Brisbane, Queensland. 4000.

And why should you write letters?

Queensland becomes a must to visit for every herpetologist sooner or later. Most of us have but a short time to travel and *the Mon Repos Turtle Rookery is the only chance we will ever have to see turtles, let alone nesting ones.* So write three letters this week. Use the italicised statements above in preparing your letters.

The Mon Repos Turtles need all the help you can give them!

THE OLIVE RIDLEY TURTLE, *Lepidochelys olivacea*, RECORDED FROM SOUTH QUEENSLAND.

* Colin J. Limpus, • Jeffrey D. Miller, and * Annette Fleay.
* Queensland National Parks and Wildlife Service, Pallarenda, Townsville, 4180.
• Department of Zoology, University of New England, Armidale, 2351.

The olive ridley turtle *Lepidochelys olivacea* (Eschscholtz) is poorly known in Australia. In eastern Australia the species has been recorded from only three widely separated localities: Cape York, Cairns and Geelong (Limpus and Roper, 1977). The two beach washed specimens from Mon Repos described below are the first records of the species from south Queensland.

On 5th December, 1979 a freshly dead adult female *L. olivacea* was found on Mon Repos beach (Queensland Turtle Research No. X 28069. Curved Carapace measurements: length = 69.5cm, width = 71.5cm, Skull width =12.4cm). This turtle was extremely emaciated. There was a partly healed contused fracture to the right temporal region of the skull. Decalcification of bones was advanced. Numerous barnacles *(Chelonibia testudinaria, C. caretta* and *Platylepas sp.)* and bryozoans encrusted the carapace, plastron, neck and base of flippers. There were no large yolky follicles in the ovaries nor were there shelled eggs in the oviducts. A second specimen, an incomplete skeleton of a recently dead subadult, (No. X 28017) was found 1km north of Mon Repos beach on 20th January, 1980. (Curved carapace length = approximately 52 cm, skull width = 9.3 cm). Scute arrangement: Nucal 1, postpygals 2, costals -/7, marginals 12/-, prefrontals 2 pair, postoculars 3/3, postparietals 2 (symmetrical). The dry scute fragments adhering to the carapace were bronze (5E5, Kornerup and Wanscher, 1978) in colour and very thin, their thinness contrasting with the thicker scutes of loggerhead turtles, *Caretta caretta,* and green turtles, *Chelonia mydas,* of similar size.

These specimens were the first *L.olivacea* found at Mon Repos, after 12 years of intense monitoring of sea turtle populations in the area. It is unlikely that they were residents of a local feeding ground or that the female migrated to nest in this area and *L. olivacea* are thus regarded as waifs to the Mon Repos area.

While the low density *L. olivacea* nesting that occurs in the north eastern Gulf of Carpentaria would seem a likely origin of the eastern Australian specimens, the species also has been recorded breeding in the Solomon Islands (Australian Museum specimen R 3411: hatchling collected Malayalta, Solomon Islands — Registered 27th August, 1902) and McKeon (1977) recorded a mating pair near Honiara, Solomon Islands. Thus it is uncertain from which breeding grounds the *L. olivacea* of eastern Australia originated.

Useful information can be obtained from beach washed specimens and we urge that sightings of beach-washed turtles in eastern Australia and New Zealand be reported to the Turtle Research Project of the National Parks and Wildlife Service of Queensland or to the local state or National Museum. A good photograph of the turtle, the skull or a selection of bones and scales are needed for positive identification. The inclusion of two measurements (the midline length of the carapace and the length of the tail beyond the carapace) would greatly increase the usefulness of such a report.

Acknowledgements:

The assistance of the numerous student and teacher volunteers within the Queensland National Turtle Research Project of the Queensland National Parks and Wildlife Service, who patrolled the Bundaberg beaches is gratefully acknowledged.

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A LIZARD STUDY ON GREAT BARRIER ISLAND

Bruce B. Dick, (NZHS) Student, Massey University, Palmerston North, N.Z.

During 1979 Mark Vickers and the author made two trips to the northern end of Great Barrier Island, firstly from January 11th to 17th, and secondly during winter from August 2nd to 6th. Both were study expeditions with the aim of observing and catching *Leiolopisma homalonotum,* hopefully to supplement those already in captivity and to form a breeding colony as a conservation measure.

The following species were recorded: *Cyclodina aenea, C. ornata, Leiolopisma homalonotum, L. moco, L. smithi, L. suteri* and *Hoplodactylus pacificus.* Species that also probably live in the studied area but which were not recorded are: *Naultinus elegans* (pers. comm.), *Hoplodactylus granulatus* and *H. maculatus.*

Cyclodina aenea (Copper Skink):

These were abundant in nearly all suitable habitats, from under *Leptospermum* scrub (both immature and mature), shore verges and forest.

C. ornata (Rata Skink):

Hardy (1977) recorded catching two specimens from this area, presumably in similar habitat as *C. aenea.*

Leiolopisma homalonotum:

Most available time was spent hunting for this species with little success. Very little is known about the species (endemic to Great Barrier Island) at present, but from the evidence and information received it must be considered rare. Recent evidence indicates it lives in areas of scrub or forest cover with a co-relation with watered areas.

L. moco (Moco Skink):

This species prefers open areas of grassland often around the edge of *Leptospermum* scrub (coastal strips or pastureland). Only a few specimens were observed but it appears this species is fairly common since most hunting was carried out in shaded, moist habitats.

L. smithi (short-tailed Skink):

These were observed, sometimes in great numbers, and were numerous throughout most shore habitats.

L. suteri (Oviparous Skink):

Only one dead specimen was found though extensive searching was done along the shoreline from enclosed bays to exposed stony beaches. It must be presumed this species is scarce and scattered in the area studied.

Hoplodactylus pacificus (Hauraki Gulf Gecko):

A few were seen, but like *L. moco* hunting was not done in suitable habitats, so they may be more common than expected.

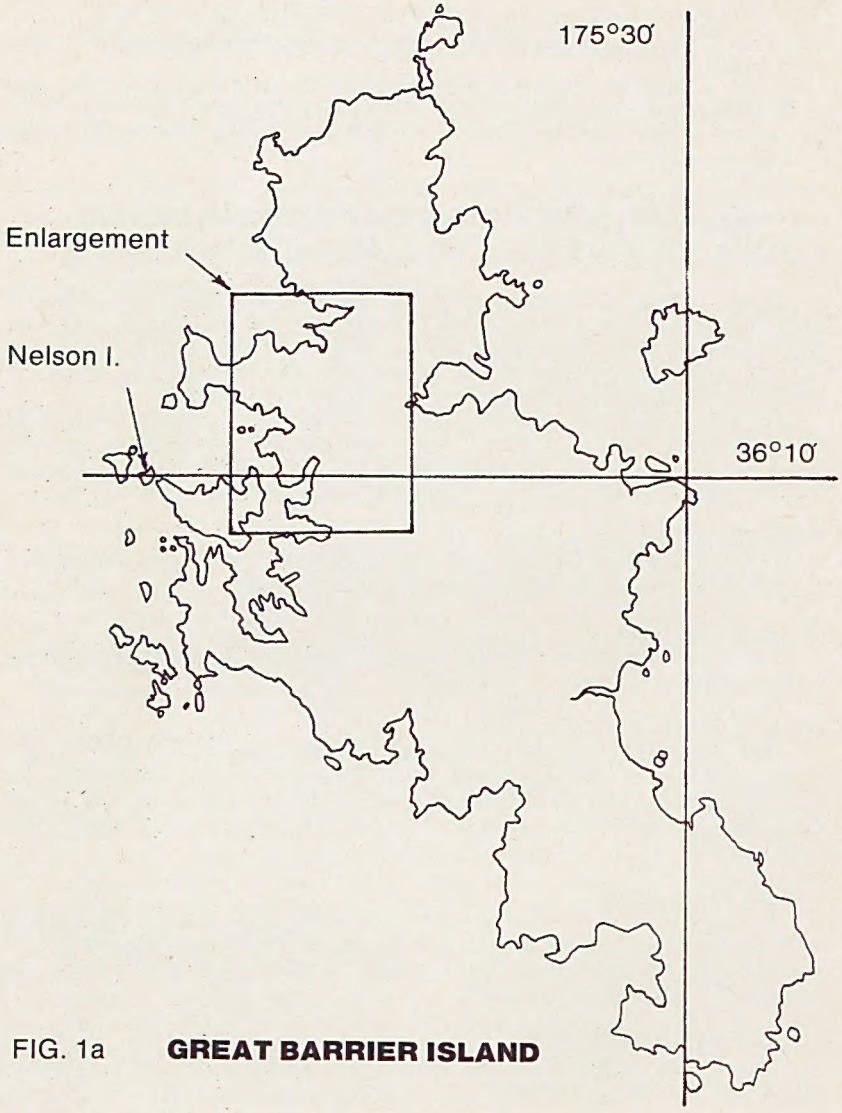


FIG. 1a **GREAT BARRIER ISLAND**

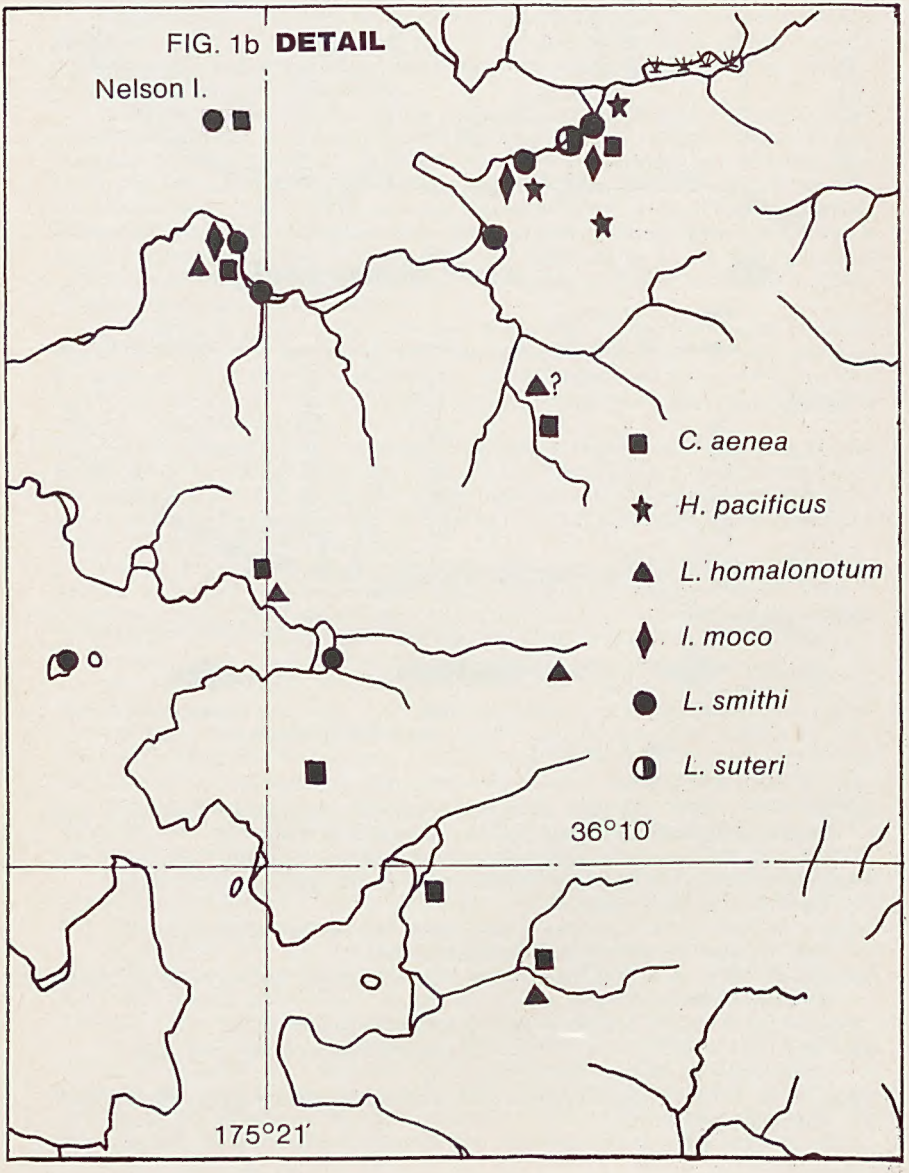
Other Species:

There is a report from local residents of a colony of *Naultinus elegans* (North Island Green Gecko) behind an area of swamp in the north (approximately 36° 07′ S, 175° 23′ E).

Both *Hoplodactylus granulatus* (Forest Gecko) and *H. Maculatus* (Common Gecko) are recorded from the southern end (personal observations 1976), so presumably they occur in this area where suitable habitat is available.

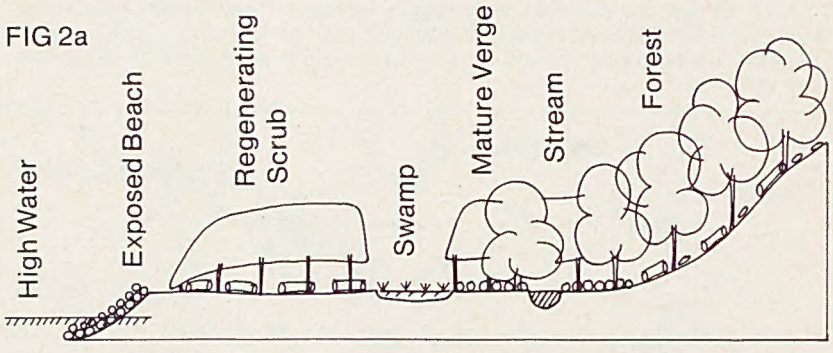
GENERAL:

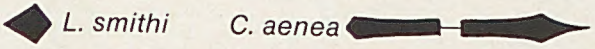
The most obvious feature of the area was the wholesale destruction of the original vegetation; burning of scrub and milling of the forest. Only a small patch of original bush survives near the summit (Mount Hobson). There is a very good scrub regeneration partly due to the absence of several major pests (Brush-tailed Opossum, Red Deer). No lizards were found around logs in mature scrub since the logs were obviously burnt.

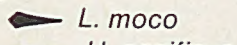


ZONATION AND LOG DENSITY OF LIZARDS FROM OBSERVATIONS ON GREAT BARRIER ISLAND.

FIG 2a







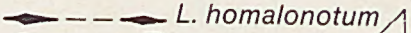
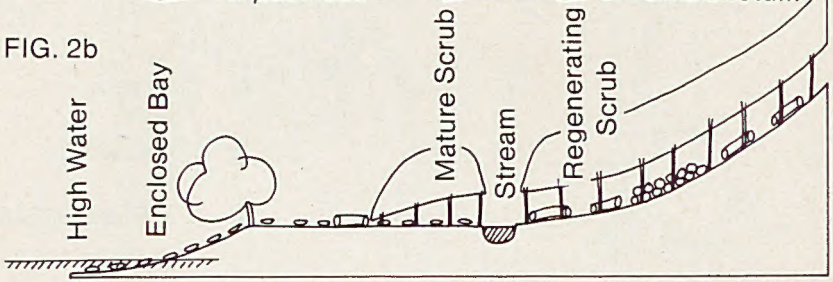
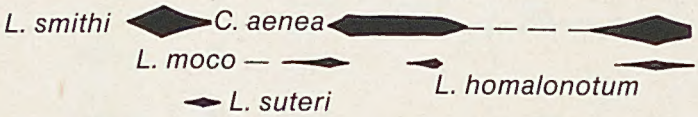


FIG. 2b





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Varanus tristis — A VARIABLE MONITOR

Trevor Christian, (VHS) c/o 16 Suspension Street, Ardeer. Victoria. 3022

One of the most widespread of Australia's monitor species, *Varanus tristis* is also one of the most variable of form.

It also occurs as two distinct races. The Black-headed Monitor *(Varanus tristis tristis)* and the Freckled Monitor *(Varanus tristis orientalis)* with intermediate specimens occurring where the two races converge.

The Freckled Monitor is the northern representative of the two, occurring in semi arid to tropical woodlands from north-west Australia to eastern coastal Queensland. The Black-headed Monitor is found in the arid woodlands and deserts of central and southern Australia.

The Freckled Monitor is, generally speaking, a tree dwelling monitor and similar in form and habits to the Spotted Tree Monitor *(Varanus timorensis)* of northern Australia. (Diag. 1.). The Freckled Monitor is probably less dependent on trees than the Spotted Tree Monitor and, in fact, in some areas appears to be more associated with rock outcrops. One such area is Mt Stuart near Townsville, N.Q. All specimens that I have observed or heard of from this area have been found in close proximity to granite outcrops. Freckled Monitors, as a rule, are associated with dry country whereas Spotted Tree Monitors are more at home in the wetter coastal woodlands and rainforests.

Townsville is in fact one of the few areas that I have found both of these monitors living in the same area, probably because it is one of the driest areas on the eastern coast of Nth Queensland. It could be because of the competition from such a similar animal that the Freckled Monitors from this region have adapted to living in a different habitat.

Moving westward from Townsville, the Freckled Monitors become more aboreal in habitat. At Mt Isa and Cloncurry, I have found them living in the hollow limbs of Snappy Gums which is by far their preferred habitat in the region and also River Red Gums. They have also been recorded as living in the hollow limbs of Coolibah Trees at Horton, near Mt Isa.

As with any animals, there are always individuals who behave in an untypical fashion and at Mt Isa I have found specimens of the Freckled Monitor living in rock crevices and even under slabs of concrete. This is, however, probably merely a reflection of the commoness of the species in the area and these individuals are most likely just an overflow from the main resident population.

Moving further west from Mt Isa, the Freckled Monitors begin to merge with the Black-headed Monitors. The Black-headed Monitor is a larger and darker monitor growing to approx 75cm (total length) compared to 60cm (total length) for the Freckled Monitor (S. Swanson —1976). I have seen a specimen from Camooweal N.W.Q. that was impossible to place securely in either subspecies.

The true Black-headed Monitor colouration probably begins around Barry Caves N. Terr, and it was in fact at this locality that I caught my first specimen, a young gravid female that later laid seven eggs (mid Sept).

The typical specimens of the Black-headed Monitor tend to be largely ground dwellers and are better physically adapted for this mode of life than the Freckled Monitor, being larger animals and faster runners.

Once again, amongst the Black-headed Monitors can be found two distinct colour forms. One type has a black, red and brown mottling on the back whereas the other retains the ocellations typical of the *orientalis* variety. Both types, however, have the larger size and black heads and tails typical of *V. tristis tristis.*

As with the Freckled Monitors, the Black-headed Monitors are not restricted to the one environment and will readily make use of hollow tree limbs, rock outcrops etc. From my own experience it would seem that the degree to which the ocellations are developed is directly related to the density of trees in the area. The specimens lacking ocellations coming from treeless desert areas and vice versa.

The Black-headed monitor is one of the most common monitors of the drier inland regions and they can be often seen sunbaking on the roads and open areas during the warmer parts of the day. One habit of the Black-headed Monitor that helps distinguish it from other monitors (particularly at a distance) is its tendency to curve its long tail in a high arc over its head while sunbaking. (Diag. 9.). I have never seen any other species of monitor, Freckled Monitor included, resting in this fashion. This classic posture is usually followed by an amazing burst of speed as the lizard is approached and in a flash it has disappeared amongst the spinifex.

Heading north from Newcastle Waters N. Terr, the Black-headed Monitors once again merge with the Freckled Monitors which are commonly encountered in hollow tree limbs along waterways such as the Katherine River. Northern Territory specimens of the Freckled Monitor that I have seen are similar to Mt Isa specimens in most respects, but perhaps not quite so brightly coloured.

The only Black-headed Monitor I have seen in W. Aust. and that I have managed to get close to was a specimen from the arid woodlands on the north coast between the Great Sandy Desert and Broome. The country consisted of dry red sandy soil sparsely vegetated with patches of desert wattles and casuarinas. This particular specimen had some characteristics of both races of *tristis* having the larger size (72cm total length) and darkish head and tail of the Black-headed Monitor while it had a typical Freckled Monitor pattern on the back, though somewhat duller in overall colouration than most *orientalis* I have seen. It was found living about 5 metres up in a hollow branch of a completely dead *Acacia aneura* tree.

All specimens of *tristis* I have seen south of Tennant Creek N. Terr, have been Black-headed Monitor colouration, the only noticeable change being that they seem to become duller in colouration, losing more of their reddish tinges as they move from the spinifex deserts of the centre into the saltbush deserts of Southern Australia. T. F. Houston (Dragon Lizards & Goannas of Sth. Aust, 1978) reports of intermediate specimens coming from Central Australia and it is probable that these exist around the mountain ranges and waterways of the Centre.

The only other specimen I have seen that is worth mentioning was a typical Black-headed Monitor specimen with reddish ocellations on the back, from Broken Hill N.S.W. Whether or not that happens to be the south eastern limit of their range, I do not know, but it is most likely that they are completely absent from Victoria and restricted to the arid rocky and sandy areas of Western N.S.W.

Diag. 1. *Varanus timorensis.* Rockhampton Queensland.

Diag. 2. *Varanus tristis orientalis.* Mt Stuart, Nth Queensland.
Head: Pale greenish/yellow with black markings.
Body: Red and black reticulations over pale greenish/yellow base to form ocelli, each with grey spot in centre.
Forelimbs: Grey with pale green/yellow ocelli, each with grey spot in centre.
Hindlimbs: Similar to forelimbs but with darker basal colour.
Tail: Off-white with dark grey bands, dark grey tip.

Diag. 3
Varanus tristis orientalis. Mt Isa, Queensland.
Head: Light reddish brown with darker flecks.
Body: Light reddish brown with red and grey tinges surrounding off-white ocelli with grey spots. Ocelli more or less arranged in bands across back.
Forelimbs: Grey with white spots.
Hindlimbs: Grey with white spots.
Tail: Reddish brown, becoming darker towards the tip. Some lighter and darker scales towards the base giving a speckled appearance.

Diag.1



Diag. 2



Diag. 3



Diag. 4.

Varanus tristis tristis. Frewena, Nth Terr.
Head: Dark brownish/black.
Body: Cream with pink and brown mottling (no ocelli).
Forelimbs: Dark brown with light flecks.
Hindlimbs: Black with white spots.
Tail: Reddish brown base with paler flecks becoming darker towards the tip. Last 2/3 black.

Diag. 5.

Varanus tristis tristis. Kingoonya, Sth Aust.
Head: Dark Brown.
Body: Greyish brown with pale ocelli, each with dark centre.
Forelimbs: Greyish brown.
Hindlimbs: Dark brown with white flecks.
Tail: Brown base with a few white scales getting progressively darker. Last ½ dark brown to black.

Diag. 6.

Varanus tristis sp. N.W. West Aust.
Head: Dark brown.
Body: Pink with black reticulations enclosing pale grey ocelli, each with black centre. Overall colouration very dull.
Forelimbs: Dark brown with pale buff patches and ocelli.
Hindlimbs: Dark brown with pale buff patches and ocelli.
Tail: Basal third mottled pink/brown and black. Remainder black.



Diag. 9.

Varanus tristis tristis — Resting position.

Diag. 4.



Diag. 5



Diag. 6



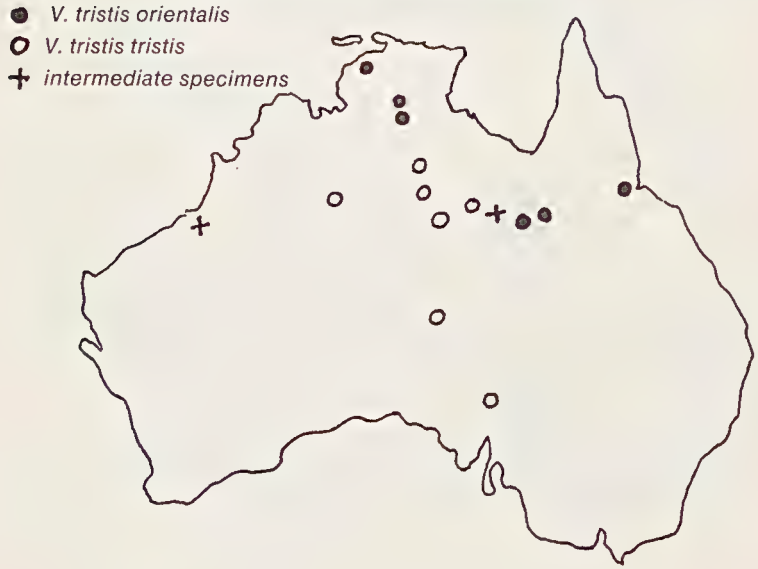
Diag. 7.

Varanus tristis — General Distribution.



Diag. 8.

Varanus tristis — Personal sightings.



OBSERVATIONS OF BEHAVIOUR PATTERNS DISPLAYED BY A PAIR OF BEARDED DRAGONS,

(Amphibolurus barbatus) (CUVIER).

Bob Pickworth. (AHS) 160 Blaxlands Ridge Road, East Kurrajong. N.S.W. 2758.

Introduction:

Between September 29th and October 7th, 1979 two mature Bearded Dragons *A. barbatus* were collected from cleared farmland in the district of Kurrajong near Sydney (latitude 33° 34′ S, longitude 151° 41′ E). They were a male and female with snout to vent measurements of 23cm and 25cm respectively.

Being spring neither specimen was in "prime condition" though both were healthy and free from ecto-parasites, disease and deformities.

The specimens were placed in a terrarium measuring 150cm × 90cm × 90cm. The floor covering consisted of dirt, leaves and bark taken from the site of capture, as well as a hollow bough from a dead gum tree.

Observations:

The specimens were released on 15th November, 1979 between 10am and 11am in a paddock adjacent to and not more than 300 metres from the original site of capture.

Immediately on release the male scuttled away towards a large black wattle *Acacia decurrens* about 15 metres distant. The female remained motionless in an area of open ground covered by short grass and herbage. After about 7 minutes, during who time neither specimen moved, the male slowly approached a patch of flowering dandelions and began to eat one. After having eaten a further four flowers the male moved his interest from the flowers to the female which still remained in a fixed position with both front legs straight and head erect. Such a position afforded maximum spread of vision.

The male tilted his head at various angles to view the surroundings then moved off quickly in the direction of the female. The female then ran towards an area of long grass, bracken ferns and saplings. After having covered about 5 metres she stopped. After a pause of approximately 3 minutes the male slowly bobbed his head up and down. This occurred twice and lasted for about 3 seconds. The colour of the male had now assumed a very light grey tone except for the beard which had noticeably darkened to almost coal black. The top front of the head, i.e. the anterior dorsal head region also changed colour to a grey-green shade, lighter than previously coloured.

After pausing for a further 3 minutes the male scuttled around the front of the female in an arc, maintaining a distance of between 2-3 metres from her. When he drew parallel to the female he halted and again commenced the head bobbing movements. This time the bobbing was more erratic, it occurred five times in about 3 seconds. The male paused as if waiting for the female to respond (which she did not yet do). He commenced again at about the same rate and frequency as before. After the third pause the female responded by tentatively bobbing her head up and down once, then headed again for the bracken fern . The female covered about 2 metres and halted. The male remained motionless whilst observing the female's movement. He then lifted his left front leg very slowly and moved it in a circular motion, placing it on the ground. This "pawing" action may best be described by comparing it to the action of a child doing "dog paddle" in the water, though very much slower. It took approximately 4 seconds from the time the leg was lifted until it was replaced on the ground. The male paused briefly (about 3 seconds) and recommenced "the pawing". The female responded by bobbing her head up and down twice.

The male immediately reciprocated, bobbing his head up and down twice before moving off hurriedly towards the female and halting at a distance 1.5 metres from her. The male paused for about 6 seconds, after which the female lifted her right front leg and slowly "pawed" the air as the male had done.

The male and female communicated with this "bobbing" and "pawing" behaviour, frequently alternating legs for approximately five minutes.Occasionally the leg of the male did not touch the ground but paused mid way through its arc a few centimetres above the ground, before it commenced its circular movement again. The female was not observed to do this.

After about five minutes of the "bobbing" and "pawing" the female hurried toward the area of thick cover but halted after having covered about 2 metres. The male remained stationary but turned his head to follow the females movements. He commenced the pawing behaviour again, the female reciprocated. The male then scuttled hurriedly toward the female and stopped about .7 metre away from her. He then bobbed his head up and down several times rapidly, and charged toward the female, gripping her by the neck just behind the tympanum. At this point the colouration of the male was more pronounced than before. The female gave her head a violent single shake which dislodged the male and hastily disappeared into the cover of bracken etc. The male shortly afterwards headed in the same direction. The thick cover prevented further observations.

Discussion

The casual observer may have described the above behaviour pattern as a very graceful and elegant animal ballet. From my observations I feel that it was a courtship display for the following reasons:

1. Both specimens had been kept together over a period of four weeks. It is fair to assume that some familiarity between the two would have existed, i.e. they were more likely socially compatible.
2. The specimens were a pair, i.e. male and female.
3. The fact the specimens were a pair and that they had been held together in captivity for a month would have reduced the possibility of the behaviour being a territorial display.

If the observations were a courtship display, there are several reasons why the female apparently refused the advance of the male and did not mate, one being that the female lacked condition necessary for the development and support of eggs. Neither specimen had voluntarily eaten any food offered to them during their captivity. (They consistently rejected young and immature mice, crickets, grasshoppers, lettuce, dandelions moths and other available insects).

The second possibility is that the female was more intent upon vacating the area than upon the display of the male.

Another possibility is that the behaviour pattern elicited by the female was normal or true to type and the female of this species diaplays passive behaviour responding to the males active antics. This is entirely likely as the specimens were aware of my presence during the 30 minutes they were being observed even though I made every effort to remain quiet and motionless. It is also likely that had I been able to continue watching them I may have observed mating. I feel that the female's interest in the male was secondary and that her primary concern was to vacate the area, seeing me as a threat.

Conclusion.

Although I have observed "headbobbing" and "pawing" behaviour in other species of *Amphibolurus* I have never observed a male attempt to grab a female by the neck. It is this behavoiur, which speculatively was an attempt to grab the female prior to mating, allied with the "bobbing" and "pawing" and distinctive coloration that led to the hypothesis that the behaviour pattern observed was a courtship display.

In stating this it is noteworthy to quote Cogger (1975) who says that *A. barbatus* is a species "encompassing forms which vary considerably in habits and other aspects of their biology".

It is possible therefore thst the behaviour pattern noted above could vary considerably between "forms".

To make any definite comments about such behaviour it is important to observe the courtship displays and subsequent matings of several pairs of *A. barbatus*. Only by doing this could an accurate assessment of such behaviour patterns be made.

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CANKER AND ITS EFFECT ON A WATER PYTHON

(*Liasis mackloti*)

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During the winter of 1977 a male Water Python in my collection contracted necrotic stomatitis (canker) and, at the same time, pneumonia. The infections, when first noticed, were well advanced. The canker was promptly attended to by the application of the antibiotic Terramycin and an antifungal, and the pneumonia by the administration of Chloromycetin, (Rankin 1975). Within a matter of several weeks the infections were eliminated.

From my observations it appears that the canker was not caused by an abrasion to the mouth, the often mentioned reason for its development. No abrasion was evident when the snake was inspected for canker. Also, as the snake had been inactive for several months prior to the disease being noticed, the opportunity for an abrasion to occur was minimal. There was however, a failure of the cage's heating system. The temperature of the cage was approximately 14°C when it was first noticed the heating system was not functioning and this may have been the cage temperature for up to a week.

In discussions with a veterinarian (David Schultz), it appears from his investigations that the canker causing bacteria are present in the mouth at all times (commensals) and when conditions are suitable they multiply rapidly. Suitable conditions may result from an abrasion to the mouth and from my experience another should be added, namely a considerable drop in the temperature of the surroundings for a period of time. In this instance the temperature drop was 11°C over the period of about a week. The pneumonia would also have lowered the snake's resistence and possibly made it more susceptible to the canker.

The canker presented me with a further problem. After it had been cured it was found the snake had lost the tip of its tongue and was left with a stub that could barely be protruded from the mouth. It appears the loss was due to the canker. As could be expected the snake now refused to feed and so it was decided to force-feed it.

Initially, minced steak (not mince), egg (whole) and vitamins (Pentavite) were supplied via a cake icing syringe with a piece of plastic tubing attached. The tubing, about 5mm in internal diameter and 200cm long, was well rounded at the end. It was also covered with a small amount of lubricant (vaseline) before being placed in the oesophagus. This mixture was difficult to administer due to the bulkiness of the meat which, even finely ground, clogged the tubing. A better mixture was sought and finally baby food (strained steak and egg) plus vitamins was found to be more suitable.

The snake was fed this mixture at irregular intervals of between two and four weeks for over three months during the summer. It appeared healthy and showed no further ill-effects from the experiences it had been through. At various times towards the end of summer in 1978 several rats and mice were offered and refused, though to stimulate the appetite vitamin B12 in the form of Cytomin "100" was being administered (Hill, 1975). During the winter of 1978 the snake again became inactive.

With the approach of the warmer months towards the end of 1978 a mouse was offered and taken. However, I noticed a distinct change in the snakes scenting technique to identify prey. Instead of detecting the mouse from a distance the snake now extruded a small mass of bubbles and withdrew it into the mouth with the stub of the tongue. Scenting probably comes about then by a combination of the stub and the bubbles being passed over the Jacobson's organ. The effectiveness of this method was sufficient for the mouse to be identified though the snake must virtually, and sometimes does touch the prey.

In the past two summers the snake has taken its food in the typical "relentless and efficient" (Gow, 1976) manner, without mouthing it. It is now feeding quite normally.

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NOTES ON THE REPRODUCTIVE BIOLOGY OF THE EASTERN BLUE – TONGUE SKINK, *Tiliqua scincoides* (SHAW)

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Details of the reproductive biology of Australian skinks are relatively poorly known, although most modern revisions of Australian genera have attempted to include some details of reproductive mode, clutch or litter size, and breeding season, to the point where Greer (1974, 1979a) has considered reproductive mode and clutch size as a generic and even potential specific character. Possibly because of its size and the ease with which it can be maintained in captivity, reproduction in the Eastern Blue-tongue is relatively well documented.

The species was first described as being viviparous by Haake (1885), confirmation coming with the description of the placenta and foetal membranes by Flynn (1923), Harrison and Weekes (1925) and Weekes (1927, 1930, 1935), although Lucas and Frost (1894) had reported the species to be oviparous, describing a specimen containing "fifteen full-size eggs, in none of which was there any trace of an embryo." Willis (1932) provided a detailed description of a twinned embryo of this species. Timing of mating and parturition, and litter size have been noted by a number of authors (Table 1). Le Souef (1918), Blacket (1926) and Tschambers (1949) provide descriptions of parturition, Swan (1972) adding to these three instances of simultaneous birth within the same litter. Brief descriptions of the young and some measurements are provided by Longley (1939) and Tschambers (1949). Le Souef (1918), Blacket (1926), Chaumont (1963), Worrell (1963) and Swan (1972) note that the egg sac and foetal membranes are consumed by the young immediately after birth.

However, several aspects remain poorly known or unrecorded. Some of these gaps are filled by data on spirit specimens in the Australian Museum collection and captive specimens in the author's collection.

CAPTIVE NOTES:

Five juvenile *T. scincoides* were presented to the author on 5/2/1979, part of a litter of 11 born on 2/2/1979 to a specimen from Bondi Junction, Sydney. These specimens were initially housed in a 60cm × 30cm aquarium tank heated and lit by a 100W incandescent globe. Three of these (1 male, 2 female) were later transferred, along with two juvenile *T. nigrolutea*, to a 2m × 35cm tank, in which they have remained to the present time. This latter enclosure is heated and lit by 2x 100W incandescent globes suspended 30cm above the substrate. Photoperiod is maintained at 12hr L: 12hr D, and diurnal temperature maintained at 27-35°C

throughout the year. Fresh water is available at all times, and canned cat food fed *ad lib* every 2-3 days. Growth rates of these specimens are given in figure 1.

On the 23rd November, 1980, a litter of 9 young was discovered in the cage, having been born within the previous 12hrs (when the cage was last checked). Neither of the two female *scincoides* had appeared gravid, and no mating activity had been observed. However, it is assumed that the larger female was the parent, as the smaller specimen had only recently recovered from a severe respiratory tract infection and had remained noticeably thin over the preceeding 6 months.

During fieldwork on 16/1/1980, a female specimen of *T. scincoides* was collected on the road 27km SE of Bombala (36°55′ S 149°15′ E) on the Cann Valley Highway. The specimen appeared slightly more bulky than was typical for the species, and was considered to be gravid. This specimen was housed in an outdoor brick-walled enclosure 2m × 2m, receiving direct sunlight for approximately 8hrs per day during summer. Also in the same cage were 1 male *T. scincoides* and 3 *T. nigrolutea*.

On the 24th February, 1980, 10 juveniles were found in the cage. One specimen appeared to be deformed, being unable to use its hind legs, or withdraw its tongue. Two other juveniles escaped from the enclosure and were killed by a dog. Measurements of the remaining 7 specimens are given in Table 2, along with measurements of the litter of 9.

AUSTRALIAN MUSEUM SPIRIT SPECIMENS:

Following the two captivity records, the author examined all newly-born spirit specimens of *T. scincoides* in the Australian Museum collection. Only those specimens that had accompanying register data on date of birth or litter size, or some record showing them to have been preserved soon after birth were examined. The results of this search are given in Table 3. Gaps in the table reflect specimens that were, from their size, obviously preserved after having been kept alive for some time, or had dessicated badly before preservation, making accurate measurements impossible. *COLORATION OF JUVENILE T. SCINCOIDES:*

T. scincoides displays great ontogenetic variation in coloration, the coloration of juveniles being briefly mentioned by Longley (1939), and points of differenc between juveniles and adults noted by Tschambers (1949). Accordingly, the following composite description of juvenile coloration is given.

Overall scalation dull dorsally, glossy ventrally. Dorsally, ground colour green-brown to olive. Head unmarked, caudal part olive green, rostral part (from prefrontals fowards) grey-green. Lateral borders of dorsal body scales mid to dark brown, forming a series of very narrow dark stripes from the nape to the base of the tail. A mid-brown bar across the nape, just anterior to an imaginary line between the forelimbs. Six to eight mid to dark brown bands across the dorsum, up to six scale rows wide, frequently enclosing some cream or olive flecks, and edged with dark brown. Bands may be discontinuous, especially anteriorly, or may divide and join other bands. Tail with ten to twelve brown bands.

Laterally, the olive ground colour fades to off-white. The dorsal bands pale to mid-brown, narrow and frequently bifurcate. Usually passing caudo-ventrally, the bands may change direction to pass antero-ventrally. Upper labials pale. A dark brown temporal streak from behind the eye to just rostral to the ear. A dark streak from behind the ear, narrow initially, but broadening above the forelimb, and merging with the first body band.

Off white ventrally, with narrow (one scale width) mid-brown bands and streaks. Throat with scattered brown spots and streaks. Tail with narrow brown bands, sometimes broken, being continuations of the dorsal bands.

Forelimbs dark olive green dorsally, fading at the anterior edge to become cream antero-ventrally. Palms off-white. Hindlimb similar, but pale ventral surface having dark reticulations.

Iris bright orange-brown, pupil black. Tongue mid to dark blue, mouth lining pale to mid pink, becoming bluish at the mandibular symphysis.

TABLE 1
PUBLISHED DATA ON LITTER SIZE AND TIMING OF REPRODUCTION IN T. SCINCOIDES

Litter Size	Mating Date	Date of Parturition	SVL of Female	Length of Young	Weight of Young	Authority
3—24, mean 10						Mcphee, 1963.
maximum 20						Bustard, 1970.
max. 25						Cogger, 1979.
max. 20						Frauca, 1966.
6—20						Worrell, 1963, 1966.
max. 15, mean 10						Waite, 1929.
mean 10				100mm*		Swanson, 1976
17						le Souef, 1918.
1						Dowling & Spencock, 1964.
11		February				Blacket, 1926.
6**		3/12/1976		120mm*	20.5—30g	Barnett, 1977b.
8***						Willis, 1932.
15***						Flynn, 1925
18		9—10/2/1935		110-125mm*		Longley, 1939.
10	10/1936	30-31/12/1936		110mm*		" "
14	3/10/1938	10/1/1939				" "
6						Daly, in A.H.S., 1976.
16—18						Stephenson, " "
15						Maddocks, " "
9						Harlow, " "
7		7/2/1970				Swan, 1972.
15		21/2/1971				" "
17		14/3/1972				" "
18						Chaumont, 1963.
10				135mm*	13.5g	Honegger and Schmidt, 1964
5	gravid in	15/1/1949	227mm	86mm+	15.5g	Tschambers, 1949.
	11/1948			91mm+	14.0g	" "
				89mm+	9.4g	" "
				92mm+	14.1g	" "
				93mm+	13.5g	
				90±8mm	13.3±2.3g	

5		233mm	95mm+	16.5g	"	"
			102mm+	15.0g	"	"
			84mm+	15.3g	"	"
			102mm+	15.0g	"	"
			100mm+	15.5g	"	"
			97±7.5mm	15.5±0.6g		

+ SVL
* Total Length
** *T. scincoides intermedia*
*** No. of embryos

TABLE 2
MEASUREMENTS OF TWO LITTERS OF T. SCINCOIDES

	SVL	TL	TL/SVL		SVL	TL	TL/SVL
Litter 1	97	50	51.5%	*Litter 2*	93	41	44.1%
(23/11/1980)	96	52	54.2%	(24/2/1980)	93	46	49.5%
	100	50	50.0%		96	45	46.9%
	103	47	45.6%		93	46	49.5%
	98	50	51.0%		92	43	46.7%
	97	51	52.6%		92	41	44.6%
	97	49	50.5%		91	39	42.9%
	97	49	50.5%				
	100	52	52.0%		93±1.6	43±2.8	46.3±2.6%
	98±2.2	50±1.6	50.9±2.4%				
Female parent	298	176	59.0%	Female Parent	308	168	54.5%
Male Parent	298	172	57.7%				

All measurements in mm
SVL=Snout—Vent length; TL=Tail length

The red ventral colouring of some adult specimens (McPhee, 1963) begins to appear between six and nine months of age.

DISCUSSION:

The data here presented verifies previous reports that litter size in this species is variable, with minimum 1 and known maximum 18. Literature records of litters of 20 to 25 are not accompanied by any substantiating data. However, in so far as other members of the genus are known to produce large litters Barnett (1977b) records a maximum litter size of 67 for *T. gerrardii*), litters of "up to 25" (Cogger, 1979) should be possible. Parturition occurs between December and March, peaking in January. The available data is insufficient to determine if there is any latitudinal variation in date of parturition. Swan (1972) provides the only record of litters from the same parent in consecutive years, and it is noticeable that the date of birth becomes later in the season each year, and that the litter size increases with age. Whether this is the normal condition, a result of captivity or merely coincidental is unknown, but would appear to warrant further investigation.

If the sole record of mating and subsequent parturition date (Longley, 1939) is representative of the normal state, the gestation period of this species is around 100d, comparable with recorded gestation periods for *T. gerrardii* of 110d (Stephenson, 1977) and 101d (Robertson, 1980). The litter of 10 recorded by Longley is interesting in its similarities with the first litter reported by the author. Both are first litters for the respective females, Longley's parent being 690d old, and the author's specimen 661d. In both cases, date of parturition is early in the season, and the litter sizes are similar (30-31/12 and 10 *vs* 23/11 and 9). This suggests a minium age at sexual maturity of 561 to 590d. However, the rapid onset of maturity in the author's specimen may be put down to the absence of a period of brumation, and subsequent growth throughout the year. (Fig. 1). The only other record of age at sexual maturity is that of Harlow (in A.H.S., 1976), who noted that a female specimen raised from birth in an outdoor enclosure appeared to be "large enough to breed when 3 years old" but first gave birth at 4 years. The minimum SVL recorded for a mature individual is 227mm (Tschambers, 1949), around 75% of the average adult SVL of 300mm (Shea, unpublished data). It is noticeable in this case that the litter is at the lower end of the size range, with only 5 young. While a positive correlation exists between parent SVL and litter size for the data known, the sample size (4) is too small for any generalisations to be made.

While there is no doubt that *T. scincoides* is viviparous, a live-bearing reproductive mode being characteristic of all Australian members of the *Egernia* group (Greer, 1979b) of lygosomine skinks (pers. obs.), the sole record of oviparity for this species (Lucas and Frost, 1894) still remains unexplained. One explanation may lie with the long breeding season. Lucas and Frost obtained their gravid specimen in November. If this specimen were at an early stage of pregnancy, the 15 "eggs" mentioned would show little evidence of embryonic development. Weekes (1935: p. 627) describes the yolk content of *T. scincoides* ova as similar to that of oviparous species, and further notes (p. 628):

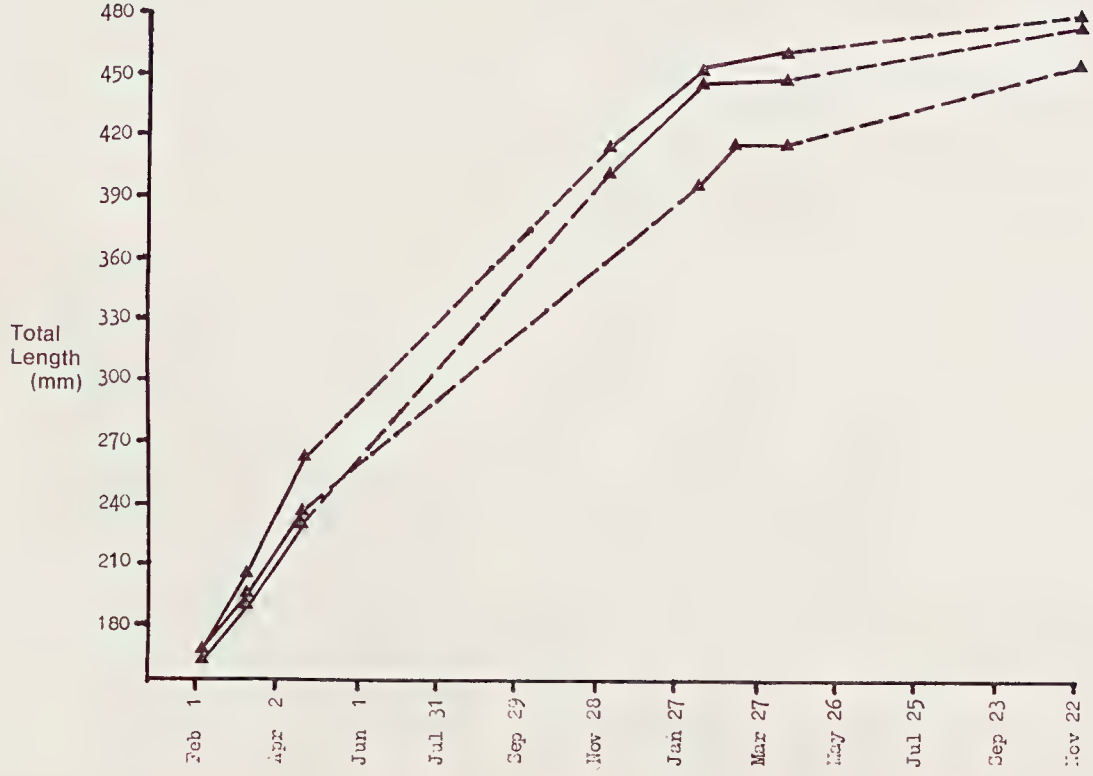
> "In some of the eggs of one specimen of *T. scincoides* the embryos had sunk so deeply into the yolk that their presence was indicated only by a depression in the yolk where the allantoic stalk emerged."

The impression in this situation would probably be of a number of undeveloped eggs prior to laying. Given a gestation of the order of 100d, parturition would have occurred by late February, well within the known range. Fleay (1931) tends to support this view when he mentions dissecting a female containing "a dozen eggs", then cites Haake (1885) and Waite (1929) to prove the viviparity of the species.

Finally, Reboucas-Spieker and Vanzolini (1978) have noted that the eating of the foetal membranes by *T. scincoides* juveniles differs markedly from the behaviour seen in other species of scincid (e.g. *Egernia cunninghami*), in which the removal and eating of the membranes is done by the parent. The only other species of

Figure 1

GROWTH RATES OF CAPTIVE SCINCOIDES



Tiliqua for which data on parturition exists are *gerrardii* (Wilhoft, 1960; Miles, 1973) and *nigrolutea* (Davey, 1944), in both of which the yolk sac and membranes are eaten by the young. It would seem on this limited data that this behaviour may constitute a generic characteristic.

TABLE 3

AUSTRALIAN MUSEUM T. SCINCOIDES: LITTER SIZE, DATE OF BIRTH AND MEASUREMENTS.

No:	SVL	TL	HL	HW	Litter Size	Date of Birth	Register Data and Notes
R39510-1, 39513-4					5(?)	2/1973	"4-6" at birth"
R39512	83	38	21.4		"	"	"
R66067	79	35	21.4	15.6		1/1967	"Born dead"
R66068	75	35	21.2	15.6		"	"
R66069	81	37	21.7			"	"
R69093-100					8	13/1/1978	
R89246	87	47	21.8	16.5	13		Only 6 young
R89247	90	47	22.6	16.8	"		preserved
R89248	101	50	24.1	18.1	"		"
R89249	104	51	23.4	17.1			
R89250	84	45	22.3	15.9			
R89251	87	47	23.0	16.0	"		"
R12234	89	36	22.0	16.1			
R21242						2/3/1964	Two-headed specimen
R40813						3/1973	
R66052	91		22.5	16.6		18/1/1968	
R66053	62	31	19.4	12.4			"3 days old"
R66055	71	32	20.1	13.5			"
R66058	87	41	23.0	16.1			
R66066						1/1968	
R66070	78	35	20.8	15.5		1/1970	"Died day of birth"
R66084	97	48	24.4	17.5		1/1968	
R66086	87	42	22.5	14.5		1/1970	
R66090					8	23/1/1968	Twinned specimen

All measurements in mm; HL=Head length; HW=Head width.

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BOOK REVIEW

"A field guide to the Reptiles of the Australian High Country". R. Jenkins and R. Bartell 1980. Ikata Press, Melbourne. Retail price $17.95. p.p.278 colour illustrations, tables, charts, diagrams.

The authors aim to write for interest levels between popular picture books and text books is largely achieved in this first ever Australian regional field guide to reptiles to appear as a separate book.

The reviews of reptilian biology and evolution are lucid and flow naturally from topic to topic. They are written in an interesting and readily understood way for the intended readership. Whether...."most of the (local) snakes....subsist principally on arthropod (insects, spiders, etc) prey" (p.40) is an appropriate generalisation is somewhat doubtful as the wild diet of Australian snakes is generally made up of vertebrate animals (as far as current knowledge goes).

The classification of reptile habitats adds a valuable and new dimension to reptile field guides in Australia. Throughout this chapter there is frequent reference to the past alienation of significant natural areas, by agriculture and silviculture. Harold Cogger's foreward sums up the essential conservation principle; legal protection of a species is worthless unless the ecosystem of which it is a part is also conserved.

The section on preservation is unfortunately so short that the intended reader would have difficulty preserving a specimen for museum purposes (e.g. a road killed specimen). A reference to a more detailed treatment should be given.

The inclusion of family descriptions and synopses gives perspective to the relationships between the reptiles of the south—eastern highland and the rest of Australia.

Each species account summaries much of the known interesting biology of the species and in many cases new information is added. In a few cases the average adult length measurements given for species are extraordinarily large (see *Cteotus robustus,* p.131, *Egernia cunninghami* p.139 *Sphenomorphus kosciuskoi* p.185, Sphenomorphus tympanum both forms P. 188g).

The chapter on snake bite is comprehensive and offers sound advice based on the latest recommended methods of treatment.

The glossary is extensive but I could not find definitions, annotations or descriptions in the book of the following terms: pygal shield, acrodont, dentition, hyoid bones, denticulated, cryptozoic, auditory meatus, subquadrate, fusiform. Some of these terms are important to the naturalist who will use this book in the field. The glossary's definition of spinose is inadequate and misleading for use in the key on p.82.

The very readable text is remarkably free of typographic errors and the diagrams and tables are commendably large and clear. Every species is illustrated with an excellent colour photograph.

In summary the book is a must for the naturalist and herpetologist who lives in, near, or intends to visit the Australian High Country. It will also become an essential addition to the Libraries of both professional and amateur herpetologists as a reference field guide.

Harry Ehmann January, 1981.

Ed.— Members of affiliated societies can buy this book on bulk order (at reduced cost) through their society's committee—see your secretary.

REMARKS ON THE PREY PREFERENCES OF

Hoplocephalus bungaroides

R. Wells, P.O. 83, Blacktown, N.S.W.

The natural prey preferences of Australias' elapid snakes are largely unknown. Shine (1977) has provided prey records for six species-viz. *Austrelaps superbus, Hemiaspis signata, Notechis scutatus, Pseudechis porphyriacus* (lowland and highland forms), *Pseudonaja textilis* and *Unechis gouldii.*

His findings indicated that the above species were essentially opportunistic, feeding principally on lizards and frogs; Shine felt that such opportunistic feeding was probably typical of Australian elapids.

No detailed study has been undertaken on *H. bungaroides* as yet, but the following observations on adult specimens in captivity suggests that this is also an opportunistic species, with lizards composing the major part of its diet.

It is quite well known that a variety of vertebrates may be utilised as a food source by this species. The limited literature however, gives only brief information on feeding, this being largely confined to broad categories such as "frogs", "mice", "birds" and "lizards", (Ormsby, 1947; Hosmer, 1952; Kinghorn, 1956; Worrell, 1963; Adams, 1972, 1973; Anstis, 1973; White, 1973; Cogger, 1975; Gow, 1976; McPhee, 1978).

Specific prey records or comparative feeding data, however, are generally lacking for this species.

Observations indicate that lizards are the most readily accepted prey, but mice (*Mus musculus)* —both laboratory bred and feral in all age classes and frogs *(Litoria citropa)* may also be eaten by captive specimens.

The records of mice seem to be based on captive conditions, but this author has never been able to induce specimens to accept mice, either dead or alive, or at any stage of growth in preference to lizards offered at the same time *(C. taeniolatus* and *O. lesueurii).* Generally it would seem that mice are not readily taken at least in the initial period of confinement. Of course with persistence, and perhaps the lack of anything else, mice can become acceptable; long term survival on such a diet is certainly possible. An outstanding record for successful captive maintenance of this species was reported by Anstis (1973). In this instance, mice were accepted over a 12 year period by a specimen; it is still in captivity on the same diet — 19 years after collecting! (Anstis, pers. comm. 3/8/1980). Nevertheless, it is quite probable that mammals are not as significant in the diet of this species as the above might indicate. Many herpetologists seem to actively avoid feeding reptiles to reptiles preferring to utilise mice because of their ready availability as a rich source of protein as well as the assumed lower risk of contamination by parasites. Consequently apparent preferences for mice by captive specimens might be more correctly regarded as a reflection of the keepers' preferences at least initially. Whether or not *H. bungaroides* would utilise mammals as prey in natural populations is difficult to say. Native small mammals such as *Antechinus stuarti* might experience limited predation, since it not only inhibits the same habitat, but also constructs its "nests" in crevices and wind-worn cavities of sandstone overhangs and ledges — thus potentially bringing it into direct contact with this snake.

Records of frogs as acceptable prey are rather limited, but again keepers' tend to avoid utilising this kind of food, mainly because of the parasite problem. *Litoria citropa* will be taken incaptivity and it is highly likely that this amphibian is taken in the natural habitat also due to its close association with sandstone exfoliations along the ridges.

Worrell's (1963) mention of birds in the diet of this species is the only record available to the author. One would tend to regard the small adult length (usually about 750mm.) and largely saxatile habits of this snake as not being conducive to utilising birds as a food source in nature. Perhaps some predation might occur on

hatchlings of species that nest in rock formations or low shrubs, or even on small sleeping birds by the exceptionally large specimens (the largest specimen examined by the author was 860mm. s.v. length in a series of 105 adults).

Lizards have been widely reported as composing a part of the diet of this species, with some authors even inferring that specific prey preferences occur. Hosmer (1952) stated that chiefly nocturnal lizards composed the diet but did not elaborate further. Ormsby (1947) and Anstis (1973) both noted that geckos were preferred over skinks, but White (1973) specifically reported that *Oedura lesueurii* and *Ctenotus taeniolatus* were readily consumed by his captive specimens. Ormsby (1947) cited an instance where a juvenile *Tiliqua scincoides* was also accepted.

Specimens under the author's care have readily consumed all age classes of *O. lesueurii* and *C. taeniolatus*, as well as two other species of skink, *C robustus* (immature) and *Leiolopisma platynota* (adult). The latter two species were offered only once. However, G. Husband (pers. comm.) has found that specimens feed readily on a number of lizard species, viz. *O. lesueurii, Diplodactylus vittatus, Amphibolurus diemensis, A. muricatus, Lampropholis delicata, L. guichenoti, L. mustelina, Siaphos equalis,* and *C. taeniolatus.* Additionally, D. McPhee (pers. comm.) has had a specimen take an immature *Phyllurus platurus,* but considers that *O. lesueurii* is preferred as a prey species.

Only two specimens of *H. bungaroides* in the collection of the Australian Museum Sydney contained food remains — one being an adult *C. taeniolatus,* the other an adult *A. diemensis.* The rest of the collection was palpated and appeared to be without significant food remains. This isn't really surprising considering that it is a species often kept in captivity and as a consequence, any natural food remains would be digested or perhaps replaced by "unnatural" items before lodgement in a scientific collection.

Of all the potential prey types in the habitat of this species, lizards are perhaps the most abundant. Of 28 species of lizards that may occur on sandstone ridges over the range of this species, only two seem to occupy, in varying degrees, the same microhabitat. (*O. lesueurii* and *C. taeniolatus*). *O. lesueurii* is nocturnal and more importantly, utilises the same rock exfoliation micro-habitat of *H. bungaroides.* The other species, *C. taeniolatus* is a diurnal, fast moving skink operating mainly from sandstone rocks on sandy substrate. It could however frequently come into direct contact with this snake, since *C. taeniolatus* is a shuttling heliotherm and as a consequence utilises exfoliations on bare rock during its foraging/thermal behaviour. The only juvenile observed by the author took juvenile *Oedura lesueurii,* which isn't really surprising considering that *H. bungaroides* are born in April when hatchling *O. lesueurii* are quite abundant.

Another interesting facet of this species diet concerns "cannibalistic" behaviour or ophiophagy. The complex interactions of snakes confined together in sub-optimal conditions often modify (and occasionally amplify) prey-acceptance behaviour beyond that "naturally" practised. Accidental ingestion is usually the case in reports of "cannibalism" — the classic situation where two snakes seize the same prey and neither release its hold — resulting in the death of one (or both!) of the predators. But occasionally, instances of direct seizure and ingestion of one snake by another occur — without apparent explanation, force the observer to consider that ophiophagy could be a natural part of a particular species feeding regime.

There could be advantages to a population practising limited predation of this kind — it would directly reduce competition for both sites and food, and indirectly bring about an increase in the main food resources (providing it wasn't limited by its own resource utilisation). If one considers the amount of lizards consumed by a small elapid, in conjunction with the reproductive potential of those lizards, the reduction of only a few predators might initially increase the lizard population considerably.

As far as ophiophagy in *H. bungaroides* is concerned the only records available to the author are as follows:

Contrary to Adams (1973) assumption that this species does not exhibit ophiophageous behaviour, White (1973) reported that an adult specimen had consumed two "large" *Cryptophis nigrescens* whilst in captivity. G. Sinclair (pers. comm. 13/10/1979) reported that an adult *H. bungaroides* (sv: ca. 800mm.) consumed an individual of the same species (sv: ca. 300mm.) during 1976. Two days after ingestion, the specimen was regurgitate in a partly digested state. Another separate instance occured in April, 1979 when an adult (sv: 530mm.) seized and subsequently swallowed a smaller specimen of *H. bungaroides* (sv: 410 mm.) which was not regurgitated. Whilst seizure could have been accidental in any of the above cases (say mistaken for a lizard), ingestion appears to have been deliberate in all of them.

Fox (1975) has shown that starvation may elicit cannabalism, but it is certainly not essential for its initiation. Limited interspecific, and perhaps intraspecific predation might be practised by *H. bungaroides* in natural populations, since suitable microhabitat is certainly very localised and there is obvious competition from *Cryptophis nigrescens* for both sites and food.

A few concluding comments about the foraging "strategy" utilised by this species might be of interest. Under captive conditions foraging *C. taeniolatus* have been observed by the author to enter "crevices" occupied by *H. bungaroides*. Often, the result was that the skink was seized and promptly eaten. Hosmer (1952) also gave an instance of daylight feeding when he reported the taking of a gecko after it retreated under a rock that sheltered a specimen of this snake. This kind of behaviour from a nocturnal snake could indicate that it might actually employ a "sit and wait" strategy to obtain its prey — by day, when diurnal skinks such as *C. taeniolatus* may be taken or by evening when *O. lesueurii* are active. Certainly, the behavioural patterns and microhabitat requirements of these two lizards would bring them into direct contact with this snake — although at different times.

The high densities and mobilities of both *C. taeniolatus* and *O. lesueurii* would most suit a "sit and wait" strategist rather than a "widely foraging" one simply due to energy conservation. Low predator energy requirements would also be an important factor in allowing such a strategy and *H. bungaroides* seems suitable in this regard, since it is known that one specimen survived a fast of 12 months (Anstis, pers. comm.).

If the observed variation in lizard prey species in captivity is also a reflection of what might occur in nature, then this might be explained by the employment of such a "sit and wait" strategy. It could also be likely that different foraging strategies are utilised in relation to the time or environmental conditions. Thus, an essentially "sit and wait" strategist might be forced to opt for a "widely foraging" strategy during times of food shortage such as after fire or some other form of catastrophe. A possible consequence of this would be the utilisation of a wider range of prey types.

Because of the obvious differences between natural and artificial (captive) environments, prey preferences exhibited by captive specimens might not directly reflect the situation in nature. However, since all of the reptile prey species taken do occur sympatrically with *H. bungaroides* it may not be unreasonable to assume that such species are consumed naturally — what might really matter is the availability and as a consequence, the proportion of each prey species taken. With this in mind *C. taeniolatus*, but more importantly *O. lesueurii*, must be considered as being potentially major prey species due to their microhabitat association with this snake.

Until a detailed dietary study on this species is undertaken, activities which result in disturbance to either of these lizard species (such as the removal of sandstone exfoliations for gardens as reported by Hersey, (1980) or the collecting of specimens as food for other captive snakes) should be discouraged in case *H. bungaroides* should experience reduced chances of survival as a consequence.

Acknowledgements

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REGIONAL NEWS

The Affiliation

Plans for the October 1981 Convention in New Zealand are well in hand. The NZHS Committee has planned activities from Saturday 24th to Wednesday 28th October, including short trips around Auckland, addresses by professional herpetologists and a visit to a Tuatara island (a special attraction not usually possible — being hosted and supervised by the New Zealand Wildlife Service). A questionnaire is being circulated soon so that group flight bookings and accommodation arrangements can be made.

Congratulations to Bruce Dick (NZHS), Greg Fyfe (VHS), Glenn Shea (AHS), and Steven Delean (SAHG) who have been awarded book prizes for their contributions in the last *Herpetofauna.* Thanks to Paul Gough, Julian White, Neville Burns, and Arthur Watts for their generous prize donations.

The New Zealand Herpetological Society has been and will be busy with Convention arrangements. The protective legislation for reptiles is almost law—it awaits Parliamentary approval and this is expected soon.

Rod Rowlands and John McCallum gave a lecture and display of lizards to the November meeting of the Royal Forest and Bird Protection Society—more presentations are planned.

Recent NZHS fieldwork on Great Barrier Island has located the largest colony yet known of one of New Zealands rarest skinks, *Leiolopisma homalonotum.*

In Whyalla the Western Herpetology Group has changed to informal irregular meetings that best suit the present members. The Committee is awaiting an increase in interest and membership before expanding the group's services again. In the meantime they are still actively committed to the regular weekly care of the reptiles in the Whyalla Fauna Park.

The Victorian Herpetological Society has been very active with local fieldwork in the past six months. Two long distance trips were made to Naracoorte in South Australia (October long weekend), and Portland in Victoria (late January) to carry out joint field work with the SAHG.

The frog and reptile protective regulations have now been in force for some time and most collections have been inspected. One hurdle still to come in the near future is interstate exchange of specimens. We are very pleased with the smooth running in of the regulations and k foward to the same situation continuing.

In Sydney the Australian Herpetological Society is very pleased with its Newsletter which is most popular with members. We recently reduced our financial strain by mounting a paid live reptile exhibit at the Australian Pet and Accessories Show 1980.

Our Macquarie Marshes bus trip last October was a great success and very enjoyable despite the drought conditions.

The March meeting of the AHS will be a reunion evening to mark the 31st year of the Society. All contactable Past Members have been invited and an illustrated 31 year History review will be presented with refreshments. We anticipate some fine company and recollections.

Visiting herpetologists in Sydney on Friday 27th March are cordially invited — please contact our Secretary. (see inside front cover).

In Adelaide the South Australian Herpetology Group has had some very warm field trips of late. The joint VHS—SAHG trip to Portland, Victoria was a success and most enjoyable despite the heat. The Junior Section of the group recently ventured beyond Ceduna towards Tarcoola across desert and discovered more Gillen's Pigmy Monitors (*Varanus gilleni)* ! They plan a major field study of the Tawny Dragon *(Amphibolurus decresii)* to start in March.

A number of members have given popular reptile lectures to community and service clubs in the past six months.

The North Queensland Herpetological Society has had its second elections and is now settling down to recruit more members. They have a permanent meeting place and members have been active giving reptile lectures to schools in the Townsville area.

A recent herp highlight in the area was the discovery of a specimen of the very rare Northern Coral Snake.

One of our subscribers, Robert G. Sprackland, has written in with the following request:

> I am conducting studies on goanna lizards (*Varanus*), and would greatly appreciate any data members could submit on ANY aspect of their biology, including captive observations. I would be particularly grateful for photographs or slides of any species.
>
> I would also like to arrange an exchange of American Publications for those from Australia. I can supply Kansas University publications mainly on South American or Kansan herpetology.

Correspondence should be addressed to:

> Robert G. Sprackland,
> Assistant Vertebrate Zoologist,
> The University of Kansas,
> Museum of Natural History,
> LAWRENCE. KANSAS. 66045. U.S.A.



ON THE RESEMBLANCE BETWEEN THE WESTERN BROWN SNAKE AND THE SMALL-SCALED SNAKE.

A photograph of the Western Brown Snake (*Pseudonaja nuchalis)* which bears a striking resemblance to some specimens of the Small-scaled Snake *(Oxyuranus microlepidotus)* see the cover photograph of Herpetofauna Vol. 12 No. 1. Scale counts readily distinguish the two, but colour and pattern are very close.

Details supplied by J. Covacevich, Queensland Museum. Photo taken by A.J. Easton, Queensland Museum.

THE GREAT BARRED FROG — MOUTH BREEDER?

Danny Wotherspoon, (AHS), Education Centre, Taronga Zoo,
P.O. Box 20, Mosman, 2088

11 a.m., 13/11/80. Allyn River (southern side of Barrington Plateau. Map reference 151°28′ E, 32°08′ S). A female Great Barred Frog (*Myxophyes fasciolatus)* was collected from shallow water,where it was sitting partly submerged among pebbles. Upon examination, eggs were noticed in the mouth of this frog. Since it is an unusual practice for frogs to hold their eggs in the mouth, particularly for Australian species, this specimen was retained for further investigation.

Upon opening the gut cavity, it was noted that the fat bodies were depleted, and that the ovaries contained many developing eggs. The eggs in the mouth could not have been her own, since she was still building up the reserves necessary for spawning.

The stomach of this *M. fasciolatus* contained four items:

a) one mostly digested *Litoria phyllochroa* (Leaf-Green Tree Frog.)
b) one partly digested *L.phyllochroa.*
c) one recently-swallowed gravid female *L. phyllochroa.*
d) one freshly-swallowed female *L. phyllochroa* with an egg mass attached externally to its flanks. *Litoria phyllochroa* were observed calling, and in amplexus on previous nights in the same area, so it is reasonable to assume that the eggs belonged to this eaten specimen.

Perhaps the predatory Barred Frog had been hunting day and night following the rain of the previous few days.

It would appear that the female Great Barred Frog may carry the eggs of other species in its mouth, but only when its stomach is so full it cannot swallow them.

My thanks to Harry Ehmann, who confirmed the details of this account.

NOTES ON AGGRESSIVE BEHAVIOUR BY GOULDS GOANNAS (*Varanus gouldii*) IN CAPTIVITY

Steven Delean, (SAHG), 49 Davenport Terrace, Seaview Downs, 5049, S.A.

McPhee (1979) and Pianka have reported on aggressive behaviour shown by Gould's Goannas when approached by humans in the wild.

Eric Pianka reports that a specimen he dug out of a burrow took on an unusual threatening position by arching its back, inflating its neck and lunging at him several times.

I have observed this behaviour on numerous occasions by my captive specimens of *Varanus gouldii*. I had been keeping a female Gould's Goanna for several months, when I obtained a smaller (female) specimen from another herpetologist.

When both of these specimens were placed in the same cage they immediately became aggressive towards each other. Each specimen has been seen to stand high on its toes, with its body leaning away from its "attacker". It would then arch its back, inflate its neck and hiss loudly at the other goanna. Should this behaviour fail to deter the "attacker", the goanna would lunge at it, whilst vigorously lashing its tail from side to side. At this stage the attacking goanna would quickly retreat to a corner of the cage.

The smaller female goanna also assumes this threatening behaviour when it is dragged from its log at night. I have also observed my female and a male Gould's Goanna performing this aggressive behaviour towards each other just prior to mating.

Acknowledgements

I would like to thank Chris Harvey for helping me with this article.

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MACLEAY'S WATER SNAKE. *(Enhydris polylepis)*

Ken Griffiths, (AHS), 90 Wattle Road, Jannali. N.S.W. 2226

This is a brief summary of observations I have made on this snake on the occasions I have been able to travel to North Queensland and from two captive specimens I have kept for approximately five years.

Unfortunately I have found no other notes with which to compare, especially regarding breeding habits. If any readers have material on this I would appreciate if it could be passed on to me.

From my observations I believe this snake to be common, although to the casual observer it is probably rarely seen. Unless you actually get into the water and search for them, which can be cold and tiring, they are very difficult to find.

Most of my observations were made during winter months where the water temperature was around 21°C and at this temperature they are still quite active. I have observed one individual in central North Queensland in water at 27°C which had just fed on two fish approximately 10cm in length. It was mid morning and, although they appear to be mainly nocturnal, this would indicate that they do feed during the daylight hours. The snake was coiled amongst dead tree roots with part of its body above the water line and the front portion suspended downwards into the

FIGURE 1. *Enhydris polylepis*



water and submerged roots. In this position, where the animal is perfectly camouflaged, it is able to use the roots as a support thus giving it greater striking speed as fish swim past. Generally, I feel that these snakes lie and wait for prey rather than chase their food.

I have observed some specimens laying on the bottom of large still pools with the front portion of their body covered in leaf litter and just the tip of the snout protruding. If it was not for the rear of the snake trailing out from beneath the debris it would be an almost impossible task to find them. This could indicate that they have the front part of the body only in camouflage for the purpose of catching prey but, as the rear of the body is not camouflaged, they may have few or no predators as adults. This could of course vary according to locality.

In captivity they are almost entirely nocturnal and they do leave the water on warm nights. They feed readily on frogs, eels and fish and can be encouraged to take fillets of fish cut into strips. I find an all glass aquarium the best method of keeping them as it is easy to maintain the water temperature with a thermostatically controlled water heater. Although they can tolerate temperatures down to 15°C or less I do not think the water temperature should fall below 20°C. On one occasion when a heater failed, the temperature fell to approximately 5°C. One snake was unharmed although very sluggish, the other was on the verge of drowning. After being held upside down and drained of water then placed on heat it just managed to survive.

The most important factor in keeping these animals healthy is absolute cleanliness. If the water is allowed to foul it will lead to scale rot and fungus. I use an Eheim Power Filter and I find that this is very effective in cleaning and aerating the water.

HATCHING OF LONG—NECKED TORTOISES THIRLMERE LAKES NATIONAL PARK

R. Kinnish, Ranger, Royal National Park.

On Monday, 19th November, 1979 I observed a Long—Necked Tortoise *Chelodina longicollis* digging a hole in sandy soil on the edge of W.E. Middleton Drive, adjacent to Lake four in Thirlmere Lakes National Park (Lake Baraba).

Later on the same day I saw a tortoise laying eggs in the hole. When she had finished laying the eggs and had covered them I placed a log next to the nest to protect it from cars.

The nest was situated approximately 90 metres from the nearest water in the lake. Between the nest and the lake there was a fairly thick cover of ground vegetation made up mainly of grass species; also there was a lot of dry material which had fallen from the large trees in the area, partly as a result of a fire which had burnt the area in the 1977/78 fire season.

Due to the drought conditions in the area, the lakes were well below their normal level, which meant that the young tortoises, when hatched, had to not only navigate through the thick grass and dry material, but had also to get through approximately 6 to 7 metres of very thick reed growth on the edge of the lake. In normal seasons the water level is between the reeds and the grass.

After checking on the nest at least once a week over the next four months, I observed on the 5th May,1980 a small oblong hole approximately 4cm long and 1cm wide in the ground. Rain had fallen since the hole had been made. It appeared that some tortoises had hatched and left the nest.

On closer examination of the nest I could see a young tortoise still in the nest so I excavated by digging a hole adjacent to the nest to avoid damage to anything that was still in it. After excavation I found three young tortoises, one egg that hadn't hatched and the remains of a number of eggs shells.

Between 1st May,1980 and 10th May, 1980, 86mm of rain fell in the area and this was the first good rain that had fallen since the eggs were laid.

From the date the eggs were laid to the date I excavated the nest and found the young was 168 days.

NOTES ON THE STARRED KNOB—TAILED GECKO, Nephrurus stellatus, CAUGHT SPOTLIGHTING.

Mark Galliford, (SAHG), 5 Tarnham Road, Seacombe Heights. 5047

On the 4th and 5th of April, 1980 two members from the S.A.H.G. and myself, conducted a field trip to the Whyalla-Cowell area, in the north-eastern corner of Eyre Peninsula, South Australia.

The trip was planned to survey the Middleback Range area, but as entry could not be gained we decided to move south to Cowell and examine the mallee areas on the eastern side of the Range, between Cowell and Whyalla, (33° 35′ S, 137° 07′ E).

These mallee areas consist of extensive natural mallee belts in between farmland and consisted of two main types:—

(1) Low mallee (predominately *Eucalyptus incrassata* and *Melaleuca uncinata)* on a red calcerous soil, with a low understory of small shrubs.

(2) Low mallee (predominately *Eucalyptus socialis, Eucalyptus gracilis* and *Melaleuca uncinata)* on a white, calcerous soil with smaller *M. uncinata* providing the dominant understory.

Spotlighting through both these areas along dirt tracks and using only the car's headlights we were able to catch 16 specimens of *Nephrurus stellatus.* A total of eighteen specimens were sighted, but two eluded capture. All of these specimens were found on or just off the track and were easily seen and captured.

The temperature on the night varied between 17°C and 20°C —conditions were cool due to the presence of a slight breeze.

The following is a table showing the male-female ratio of the specimens caught.

	Adults/Sub Adult	Juvenile
Male	5	—
Female	7	—
Unsexed	—	4

All the specimens were typical in colouration and form to the species description (see Cogger, 1975) although one adult was found to have small lumps all over its body, legs and throat region, which may have been small tumours. All other specimens appeared to be in good condition.

The specimens were caught in both habitat types, the first being captured at 7.05 p.m. (1905 hours) an hour after dusk, and the last at 11.00 p.m. (2300 hours). Although we continued spotlighting after 11.00 p.m. no *Nephrurus stellatus* were sighted after this time. This may have been due to the decreasing temperature although specimens of the Spiny-tailed Gecko *Diplodactylus ciliaris* and the Stone Gecko *Diplodactylus vittatus* were caught after 11 p.m.

In some instances, one gecko would be seen and captured close to the car, while further specimens would be sighted further up the track in the headlight beams of the car.

Nephrurus stellatus appears to be a very common gecko in this area as over 20 specimens of this gecko were collected at the A.A.H.S. Convention in March, 1979 at Iron Duke, an iron-ore range some 40km southwest of Whyalla. As in the Cowell area, these geckos are extremely abundant in the sandy, mallee area at the base of Iron Duke, where, according to members of the Western Herpetology Group, up to 30 specimens can be seen in one night.

The reptile species caught around the Cowell area during our trip are listed below:

Geckoes:	Spiny-tailed Gecko —*Diplodactylus ciliaris* Stone Gecko —*Diplodactylus vittatus* Starred Knob-tailed Gecko —*Nephrus stellatus*
Dragons:	Thorny Devil —*Moloch horridus* Jacky Lizard —*Amphibolurus muricatus*
Legless Lizards:	Worm-lizard —*Aprasia inaurita*
Snakes:	Western Brown Snake —*Pseudonaja nuchalis* Black-headed Whip Snake —*Unechis gouldii*

References:

Cogger, H. 1975. Reptiles and Amphibians of Australia. Reed. Sydney.

AVID APPETITE FOR DANDELION BLOSSOMS *Taraxarun officinale* BY A WESTERN BEARDED DRAGON *Amphibolurus vitticeps Ahl.*

K.J. Kennerson and G.J. Cochrane, (AHS), 8 Charles St. Blacktown. NSW. 2148.

We have induced both *A. vitticeps* and *A. barbatus* to consume dandelion blossoms in captivity with some degree of success.

Swanson (1976) states that *A. barbatus* will feed upon ground herbage, showing a particular liking for dandelion blossoms.

McPhee (1979) reports that *A. barbatus* diet consists of some vegetable matter, particularly dandelion blossoms.

On the 9th December, 1979 a captive juvenile *Amphibolurus vitticeps* ate 24 dandelion blossoms in one day. The juvenile dragon was approximately ten months old and measured SVL 170mm. VTL 205mm. at this date. The lizard was originally caught at Quambone Tip, Lat 59°60′ south, Long 17°00′ east.

On the 25th December, 1979 the dragon consumed 30 dandelion blossoms and 28 blossoms on the 28th December, 1979.

As well as these blossoms the lizard has accepted flies, black ants, worms, slaters, mince beef, black beetles, spiders, slugs, shortbread biscuit, banana and honey.

On the 30th December, 1979 the dragon consumed 48 dandelion blossoms and small pieces of plum and 180 blossoms during the period 7th—10th January, 1980. The largest consumption in one single feeding by the lizard was 109 blossoms on the 5th January, 1981.

The dragon has shown no signs of over-eating and has recently mated in captivity and laid 13 eggs.

References

Swanson, S. (1976): Lizards of Australia, Angus and Robertson, Sydney.
McPhee, D.R. (1979): The Observers Book of Snakes & Lizards of Australia, Methuen, Sydney.

OBSERVATIONS ON HEAT REGULATING BEHAVIOUR IN CAPTIVE SPECIMENS OF *Diporiphora winneckei* (LUCAS AND FROST)

Mark Francis, (SAHG) 22 Ross St, Seaview Downs. 5049 S.A.

Early in September, 1980, 2 specimens of Winnecke's Dragon were caught in canegrass along the Macumba River (27° 11′S, 135° 45′E) on the South Australian Herpetology Group field survey of the Simpson Desert region.

Both of these specimens were retained by me to enable observations to be made on their behaviour in captivity.

I housed the dragons in a glass vivarium, measuring 500mm × 250mm. On part of the base of the cage I placed a heating mat which was covered, like the rest of the cage, with red sand.

The sand on the heating mat often reaches temperatures of between 40—42°C making it very hard for these dragons to remain in the one spot for a long period of time.



(FIGURE 1)

Although there are cooler areas of the cage to which these lizards can retreat, they seem to prefer to remain on the heating mat.

They use their feet, however, in an unusual way to prevent overheating of their bodies. Each specimen has been seen to raise the toes of the hind legs completely off the ground, whilst balancing on the "heels", (*Fig 1*). Often they will then raise another leg off the ground and continue doing this until all the legs have been "rested".

Often they will act in this way for up to ½ hour, before leaving the mat to forage around the rest of the cage.

Acknowledgements

I would like to thank Steven Delean and Chris Harvey for helping with this Herp. Note, and Brett Leane for helping with the photo.

A NOTE ON DEATH ADDER MORTALITY FOLLOWING THE LAYING OF POISON

Keith Gilbertson Middlebrook. (SAHG), c/o 77 Northern Ave.,
West Beach. S.A. 5024

It was approximately twelve years ago that I first took notice of the Yorke Peninsula area in South Australia and have returned 2—3 times per year since then to survey the reptile populations.

Recently this area suffered a severe mouse plague, even greater than that which occurred some ten years ago. To put an end to this problem, the farmers laid heavy doses of poison. Although they were reluctant to disclose the type of poison used, I gather that it was a strychnine mixture.

During a trip to the area at the same time six death adders were counted, two were alive (1 female, 1 male) and the other four specimens (1 female, 3 males) were quite dead. All of the dead specimens were lying in the open, completely unmarked and nowhere near a road. Other dead animals seen included 2 hawks, 1 Goulds Goanna, *Varanus gouldii* and numerous shinglebacks *Trachydosaurus rugosus.*

NOTE ON THE RANGE OF THE SPHAGNUM FROG.
Philoria sphagnicolus

Danny Wotherspoon, (AHS), Education Centre, Taronga Zoo.
P.O. Box 20, Mosman. 2088

9 p.m., 10/11/80. Great numbers of *P. sphagnicolus* were found foraging on leaf litter on the floor of rainforest. Density was estimated at one per 50 square metres. They were not calling. Rain had fallen for the previous two days, but not on the night of the 10th.

One specimen, judged to be of average size for this population, was measured as 52mm snout-vent. Two nights later, only one Sphagnum frog was seen when the same area was surveyed, but large numbers of *Litoria lesueurii* were found foraging in the leaf litter.

This site was between the Williams River and Barrington Guest House, at the edge of Barrington Tops National Park. (Map reference 151°32′ E, 32°10′ S).

The range reported for *P. spagnicolus* is "from ranges near Ebor and Dorrigo to Comboyne Plateau, N.S.W." (Cogger, 1979). This population would then represent either an outlier or a southern extension of the range. A systematic survey would establish the actual situation.

Reference

Cogger, H.G. (1979): Reptiles and Amphibians of Australia. Reed, Sydney. p. 74.

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